California ISO
Shaping a Renewed Future

Deterministic and Stochastic Modeling in the ISO Study for 2014 LTPP

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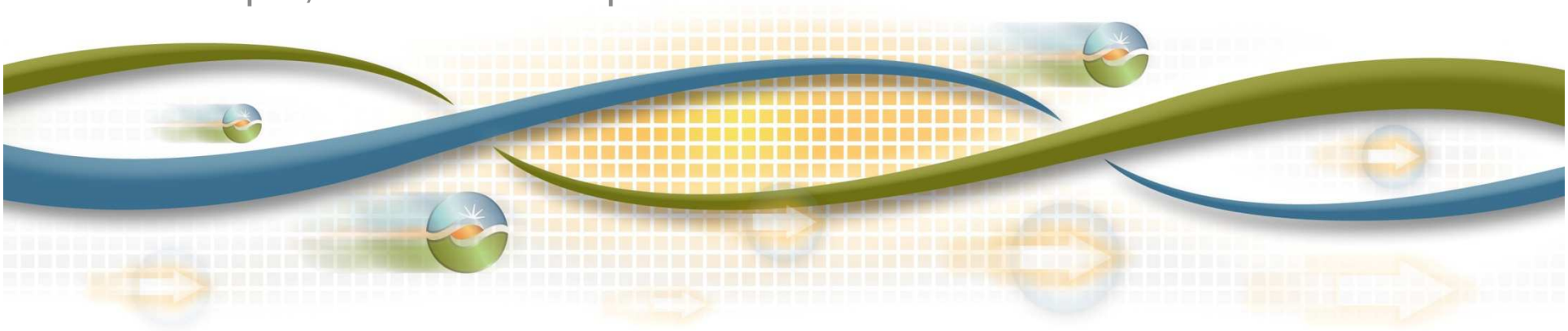

Using deterministic and stochastic modeling results in 2014 LTPP study

- The ISO plans to submit both deterministic and stochastic results in the California Public Utilities Commission (CPUC) 2014 Long-Term Procurement Plan (LTPP) proceeding filings
  - Deterministic results will be the main source for determining the need for additional capacity and flexibility
  - Stochastic results will be supporting the deterministic results

Deterministic vs. Stochastic Modeling

- A General Comparison Based on Current Status

Methodologies

Deterministic Model

- Mature and widely used
- Consistent across most models
- Detail and accurate unit commitment method and operational constraints

Stochastic Model

- Still developing
- Customized for each model
- Simplified unit commitment method or operational constraints
- Dependent on available historical data

Scenarios

Deterministic Model

- A single scenario in each case simulation
- Several scenarios, based on the CPUC LTPP scenario definitions, reflect the *most likely* future conditions

Stochastic Model

- A large set of variations of a specific scenario in Monte Carlo simulations
- The variations represent a wide range of possible future conditions

Uncertainties

Deterministic Model

- Short-term uncertainties in forecasts captured in the calculation of regulation and load following requirements
- Random forced outages

Stochastic Model

- Long-term uncertainties in weather, economic growth, etc. reflected in load forecast, renewable generation, and other key input variables
- Short-term forecast errors
- Random forced outages

Simulation

Deterministic Model

- WECC-wide scope
- Single-iteration simulation
  - Chronological
  - Full year
- Short run time
- Manageable output data

Stochastic Model

- WECC or reduced scope
- Multi-iteration Monte Carlo simulations
  - Chronological
  - For a day or days, or full year
- Long run time
- Large amount of output data

Results

Deterministic Model

- A single set of results
  - Explicit
  - Detailed
- Easy to understand

Stochastic Model

- Multiple sets of results
  - Probabilistic distributions (each presents a range of values with associated probabilities)
  - Reduced details
- To be interpreted
- To be compared to the standards for capacity and flexibility sufficiency

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Thank you!

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